by vegetative means in order to maintain its delightful characters faithfully.

The epithet 'Mauve Flower' had not been established, so I proposed instead the name *Utricularia calycifida* 'Cthulhu'. The cultivar name was nominated and submitted for publication by me on 22 October 1999. The cultivar epithet is chosen in commemoration of the fictional creature described by H.P. Lovecraft. Like its namesake cultivar, Cthulhu (pronounced "k-THOO-loo") was a denizen of a semi-aquatic land, and was endowed with countless stolon-like tentacles.

—Barry Meyers-Rice • P.O. Box 72741 • Davis, CA 95617 • USA • barry@carnivorousplants.org

Literature Reviews

Brewer, J.S. 1999, Effects of Fire, Competition and Soil Disturbances on Regeneration of a Carnivorous Plant (*Drosera capillaris*), American Midland Naturalist, 141: 28-42.

Brewer, J.S. 1999, Effects of Competition, Litter, and Disturbance on an Annual Carnivorous Plant (*Utricularia juncea*), Plant Ecology, 140: 159-165.

While the erosion of crayfish mounds tends to increase the mortality of juvenile plants of *D. capillaris*, the same phenomenon apparently favours establishment of *U. juncea*. The other details in the two papers are quite predictable. Interested readers should read the original publications. (JS)

Brewer, J.S. 1999, Short-Term Effects of Fire and Competition and Plasticity of the Yellow Pitcher Plant, *Sarracenia alata* (Sarraceniaceae), Am.J.Bot. 86: 1264- 1271.

Another article by the meanwhile well-known author. Mature plants can tolerate competition (as a result of missing fires) on a short-term basis. "Yellow" is the worst possible vernacular name for the studied pitcher plant, because it immediately evokes associations with the much more common *Sarracenia flava*. (JS)

Hoshi, Y. & Kondo, K. 1998, Chromosome Differentiation in *Drosera*, Subgenus *Rorella*, Section *Rossolis,* Cytologia, 63: 199-211.

Hoshi, Y. & Kondo, K. 1998, A Chromosome Phylogeny of the Droseraceae by Using CMA-DAPI Fluorescent Banding, Cytologia 63: 329-339.

Both papers present interesting new data (many new chromosome counts and state-of-the-art cytological characteristics) elucidating the phylogeny and speciation processes in Droseraceae. The remarkable diffused centrosomal organization of the chromosomes of many *Drosera* species (especially from the southern hemisphere) may be responsible for accelerated/facilitated differentiation at genetic level. A small shortcoming is the usage of outdated taxonomic and/or nomenclatural concepts, e.g. *Rorella* and *Rossolis* are superfluous and illegitimate synonyms of the typical subgenus *Drosera* and section *Drosera*, respectively. *Drosophyllum* (Drosophyllaceae) is evidently an alien element in Droseraceae, as demonstrated not only by recent genetic data that place it unambiguously in the immediate vicinity of Dioncophyllaceae and Ancistrocladaceae, but also by palynological, anatomical, and morphological evidence. Anyway, both papers contain valuable information and are well worth reading. (JS)

Ichiishi, S., Nagamitsu, T., Kondo, Y., Iwashina, T., Kondo, K. & Tagashira, N. 1999, Effects of Macro-components and Sucrose in the Medium on in vitro Red-color Pigmentation in *Dionaea muscipula* Ellis and *Drosera spatulata* Labill., Plant Biotechnology, 16:235-238.

Plants of *Dionaea muscipula* and *Drosera spatulata* cultivated in vitro on media containing elevated concentrations of nitrogenous compounds (NH_4NO_3 and KNO_3) showed increased proliferation by multiple shoots and generated large green plants, while plants on media with diminished concentrations of nitrogenous compounds and increased concentrations of sucrose displayed decreased size and deeper red colouration that spread from the glands or tentacles to the entire leaves. The anthocyanins responsible for the red colouration in both species are identified. (JS)

Mendez, M. & Karlsson, P.S. 1999, Costs and Benefits of Carnivory in Plants: Insights from the Photosynthetic Performance of Four Carnivorous Plants in a Subarctic Environment, Oikos 86: 105-112.

Photosynthetc rates of the four tested carnivorous plants (*Pinguicula vulgaris*, *P. alpina*, *P. villosa*, and *Drosera rotundifolia*) were lower than those of non-carnivorous plants from the same habitats. The photosynthetic capacity of the carnivorous plants studied increased with leaf nitrogen content (without reaching the level of non-carnivorous plants), but this is a trend observed generally also in non-carnivorous plants. The authors hypothesize that the main benefit from carnivory is enhanced reproduction rather than enhanced photosynthetic carbon fixation, at least in subarctic environments. Perhaps low photosynthetic carbon fixation is compensated by carbon obtained from prey here. (JS)

Moran, J.A., Booth, W.E., & Charles, J. 1999, Aspects of Pitcher Morphology and Spectral Characteristics of Six Bornean *Nepenthes* Pitcher Plant Species: Implications for Prey Capture, Annals of Botany 83: 512-528.

The authors found interspecific differences in *Nepenthes* pitcher form (they were, by the way, not really the first in this respect: in fact, many species in the genus are defined by little more than their particular pitcher forms!) and spectral reflectance patterns. They deduced from this that different prey is attracted by different species. This was partially confirmed by the analysis of prey captured. (JS)

Murphy, P.B. & Boyd, R.S. 1999, Population Status and Habitat Characterization of the Endangered Plant, *Sarracenia rubra* subspecies *alabamensis*, Castanea 64: 101-113.

Interestingly, 60% of all individuals surveyed in this study were found in a single site (out of a total eleven known remaining ones, most of which being seepage bogs). Threats to the sites include development, livestock grazing, mining, and the absence of fire (NB: Overcollection and trade, the essential "T" in CITES, are not mentioned!). (JS)

Nicholas, A., & Kondo, K. 1998, A Chromosome Study in *Drosera* of KwaZulu-Natal, South Africa, Chromosome Science, 2: 47-49.

Three chromosome counts are communicated (2n=40 for *Drosera collinsiae*, *D. madagascariensis*, and *D. natalensis*), of which the count for *D. collinsiae* is new (the count of *D. natalensis*—under the synonym *D. venusta*—was published already by Debbert in 1987, and that of *D. madagascariensis* was published already by Kress in 1970). Furthermore, the new count of 2n=40 for *D. dielsiana* is mentioned informally (as "Hoshi & Kondo, unpublished") on p. 47 (see reviews above). All species investigated have small chromosomes at mitotic metaphase that do have diffused centromeres. The chromosomal similarities between all these species are possibly due to (or the reason for the ease of) frequent gene-flow between the taxa. This would be a plausible explanation for the difficulties associated with circumscription of some of the species. (JS)

Nyoka, S.E., & Ferguson, C. 1999, Pollinators of *Darlingtonia californica* Torr., the California Pitcher Plant, Natural Areas Journal, 19(4): 386-391.

This is an interesting review of the mystery regarding the pollinators of *Darlingtonia*. Despite the fact that *Darlingtonia* flowers, like those of *Sarracenia*, appear to be modified for pollination by specific arthropods, convincing candidate pollinators have never been identified. The authors used traps to collect arthropods in *Darlingtonia* habitat and inspected them for *Darlingtonia* pollen. Over a ten-week period, 1758 insects were collected; 27 species carried pollen, but only four were found carrying *Darlingtonia* pollen! It is unlikely these are the *Darlingtonia* pollinators since only eight individuals were carrying pollen—the vast majority of the individuals in these species were not found bearing *Darlingtonia* pollen.

So what is responsible for the copious annual seed production? Flowers enclosed in mesh bags that exclude 0.75mm or larger arthropods resulted in negligible seed production, so wind can be discounted (personal observation). The authors suggest that web-building spiders are the active pollinators. (Even the most casual observer of *Darlingtonia* flowering in the wild will note that nearly every flower has a resident spider and web.) While this is not a new theory, the authors construct a plausible model for spider pollination, in which the juvenile spiders survive perhaps exclusively on nectar and pollen (few prey items are found in their webs). The pollen and nectar diet may sustain the young spiders until the annual prey population rises. Pollen/nectar feeding has been documented in various spider families, including some represented in *Darlingtonia* habitat. The most commonly collected *Darlingtonia* spiders were *Clubiona pacifica* and *Theridion differens.* The irony of vegetarian carnivores living in carnivorous vegetables is extreme! (BAMR)

Owen, T.P. & Lennon, K.A. 1999, Structure and Development of the Pitchers from the Carnivorous Plant *Nepenthes alata* (Nepenthaceae), Am.J.Bot. 86: 1382-1390.

The ontogenetic development of the secretory and absorptive glands of *N. alata* was studied and is described in this paper together with many data that have already been rerported earlier. The digestive glands at the base of the pitcher develop from single protodermal cells, which is not uncommon in such structures. (JS)

Schulze, W., Frommer, W.B. & Ward, J.M. 1999, Transporters for Ammonium, Amino Acids and Peptides are Expressed in Pitchers of the Carnivorous Plant *Nepenthes*, The Plant Journal, 17: 637-646.

The three classes of transporter proteins mentioned in the title have been shown to be expressed in various regions of the digestive zone of pitchers of *N. alata*. Their subcellular localization has been elucidated by in situ hybridization techniques. Some of the microscopic images are so spectacular that one of them was chosen as the title photo of this issue of the journal. This paper is highly recommended to all interested in the physiological details of digestion in carnivorous plants. (JS)

Spomer, G.G. 1999, Evidence of Protocarnivorous Capabilities in *Geranium viscosissimum* and *Potentilla arguta* and Other Sticky Plants, Int. J. Plant Sci., 160: 98-101.

Another interesting paper using circumstantial and (!) experimental evidence to show that carnivorous plants are not a strictly defined group. Protein digestion was tested by a modified film test, and absorption of digestion products was tested by application of radioactively labeled algal protein and detection of the label at positions in the plant that were remote from the points of application. The term "protocarnivorous" coined in this paper is unfortunate because it evokes the illusion that the author can forecast an evolutionary process. The neutral term "subcarnivorous" would be more appropriate. The nutritional significance of carnivory to the plants investigated was not studied in detail but the usefulness of (genetically?) engineered sticky crops able to utilize their prey via carnivory is discussed briefly. However, the (presumably limited) public acceptance of such products is not considered. (JS)

Worley, A.C. & Harder, L.D. 1999, Consequences of Preformation for Dynamic Resource Allocation by a Carnivorous Herb, *Pinguicula vulgaris* (Lentibulariaceae), Am.J.Bot. 86: 1136-1145.

Feeding of fruit flies to the common butterwort resulted in larger plants with more flowers and enhanced vegetative reproduction after one growing season but not within the same growing season, because the primordia for rosettes and flowers are formed 10 months before the organs develop. (JS)

Zamudio, S. 1999, *Pinguicula elizabethiae* una nueva especie de la seccion *Orcheosanthus* (Lentibulariaceae) de los estados de Hidalgo y Queretaro, Mexico. (*Pinguicula elizabethiae*, a new species of sect. *Orcheosanthus* (Lentibulariaceae) from the states Hidalgo and Queretaro, Mexico, in Spanish, with English abstract), Acta Botanica Mexicana 47: 15-22.

This new species is similar to the two known ones with round corolla lobes, *P. colimensis* and *P. cyclosecta*, but it differs from the first by summer leaves with slightly involute (vs. revolute in *P. colimensis*) margins and winter leaves that are oblong-spathulate (vs. oblong-lanceolate), and from the second by summer leaves that are obovate-spathulate to suborbicular-spathulate with dense multicellular, up to 5 mm long trichomes at their bases (vs. obovate-spathulate, with hairs up to 2 mm long). Like any other addition to the difficult section *Orcheosanthus*, this further increases the urgency of a fundamental revision. (JS)